DOCUMENT RESUME

ED 184 890 SE 030 575

AUTHOR Lyons, Linda
TITLE The Relationship of Parental Modeling, Parental Reinforcement, Academic and Career Interests to the Enrollment of High School Females in Accelerated Mathematics Programs.
PUB DATE Apr 80
NOTE 12p.: Paper presented at the Annual Meeting of the American Educational Research Association (Boston, MA, April 7-11, 1980). Contains occasional broken type.

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Acceleration: Elective Courses; *Females; Gifted; Parent Attitudes: *Parent Influence; Parent Role; Secondary Education: *Secondary School Mathematics; *Sex Differences: Sex Role: Womens Education
IDENTIFIERS *Mathematics Education Research

ABSTRACT

This study was undertaken to determine if high school females who elected an accelerated mathematics program could be distinguished from high school females who elected a regular mathematics program on the basis of parental modeling, parental reinforcement, and academic and career interests. Findings indicated that the groups were differentiated primarily on the basis of several parental variables. Parental modeling made the greatest contribution to group separation. Fathers of the accelerated group were engaged in mathematics-related occupations to a greater extent than were fathers of the regular group, whereas mothers of the former group showed limited employment patterns. Mathematics participation and graduate school plans made moderate contributions to group separation, whereas parental reinforcement for achievement made small contributions to group separations. (Author/MK)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED184890

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Linda Lyons

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

THE RELATIONSHIP OF PARENTAL MODELING, PARENTAL REINFORCEMENT, ACADEMIC AND CAREER INTERESTS TO THE ENROLLMENT OF HIGH SCHOOL FEMALES IN ACCELERATED MATHEMATICS PROGRAMS

Linda Lyons

PAPER PRESENTED AT THE ANNUAL MEETING OF THE AMERICAN EDUCATIONAL RESEARCH ASSOCIATION, BOSTON, APRIL, 1980

SE 030 575

Research has shown that sex differences in high school mathematics achievement may be explained in terms of the limited participation of females in advanced mathematics courses (Sherman & Fennema, 1977; Steel & Wise, 1979). Recent studies suggest that various non-cognitive factors may affect the decision of high school females to pursue courses of study in mathematics. Steel and Wise (1979) related lack of participation to lack of interest in math and math-related careers; Kaczala, Futterman, Meece and Parsons (1979), to expectancies of success in math; Sherman and Fennema (1977), to factors associated with the feminine sex role. Aiken (1976) noted that the effect of parental attitudes has not been clearly determined. In this latter regard, it is possible that developmental factors, which relate, primarily, to the role of significant others, would account for high school females' interest and participation in advanced mathematics. The purpose of this study was to determine if high school females who elected an accelerated mathematics program could be distinguished from high school females who elected a regular mathematics program, on the basis of parental modeling, parental reinforcement, educational interests and career goals.

Results of an earlier study (Lyons, 1977) indicated that parental reinforcement and parental modeling were salient factors in the enrollment of females in nontraditional rather than traditional graduate programs. Because participation in higher mathematics is not consonant with traditional sex-role interests, it is possible that parental reinforcement and modeling variables may also differentiate between high school females who elect an accelerated mathematics program and high school females who elect a regular mathematics program. Findings with regard to modeling behavior suggest further that fathers of the accelerated math group would be more likely to have attained a higher educational level and to have

selected mathematics-related occupations than fathers of the regular mathematics group. Consequently, the accelerated group would have patterned their mathematics program enrollment as well as their future academic and career interests in line with masculine achievement pursuits in mathematics-related fields. Previous findings with regard to the selection of the mother as a model have been unclear. In view of changing societal roles for women, further examination of the impact of maternal educational and employment patterns is warranted.

METHOD

Subjects selected for the study were 73 females in attendance at a public urban high school for intellectually gifted students. Standards for admission to this secondary school in grade seven require that students perform three years above grade level on verbal as well as mathematics achievement measures. Consequently, it may be concluded that students possess the skills necessary to perform adequately in advanced courses, and that their decision to enroll in an accelerated program in the ninth grade has been based on non-cognitive factors. To ensure the relevance of responses on parental scales, the sample was comprised of students who had always lived with both parents. Consequently, data obtained for 19 subjects were not included. Subjects included in the study were 28 females in grades nine through twelve who had elected to enroll in an accelerated mathematics program, and 26 females in grades nine through twelve who had elected to enroll in a regular mathematics program.

Maternal and Paternal Reinforcement Scales, which had been developed in an earlier study, were redesigned, to assess parental support for academic/mathematics achievement among a high school population. The Likert-type scales consisted of

15 items which were designed to assess paternal behavior, and 15 to assess maternal behavior. It was assumed that the daughter's perceptions of parental reinforcement behavior would be more meaningful than empirically developed behavior measures. Consequently, these self-report measures were constructed. Responses were scored along a 7-point continuum which ranged from "disagree very strongly" to "agree very strongly." The instruments were constructed so that each item on the paternal scale was parallel to an item on the maternal scale. Of the 15 items which comprised each of the scales, 7 were stated positively and 8 were stated negatively to inhibit an acquiescent response style.

Additionally, a questionnaire was devised to ascertain parental educational and occupational patterns, as well as subjects' academic and career interests. The data form was administered in conjuction with the Parental Reinforcement Scales.

In this study, the criterion was mathematics program membership, determined by students' enrollment in an accelerated or regular mathematics program. There were eleven predictor variables. Paternal and maternal reinforcement for academic/mathematics achievement were determined by scores on the Parental Reinforcement Scales. Six predictors were included to assess parental modeling variables, i.e., paternal and maternal education and employment patterns. The three additional predictors were concerned with the students' educational and career interests. Data were analyzed by a discriminant function analysis.

RESULTS

Centroids were computed to indicate the mean discriminant scores of the accelerated and the regular math groups. The centroids were -.7178 and .7730,

respectively. To determine if the separation of the groups was significant, the Wilks' lambda was computed. Results of this analysis are reported in Table 1.

Table 1

WILKS' LAMBDA TEST OF EQUALITY OF CENTROIDS

Λ	df	χ^2
.635	11	21.16*

* $p < .05$

Results indicated that there was a significant separation between the groups.

Correlation coefficients were computed to assess the relative contribution of each variable to the discriminant function. These data are reported in Table 2.

Table 2

CORRELATION OF DISCRIMINANT FUNCTION
AND ELEVEN VARIABLES

VARIABLE	CORRELATION
Parental Reinforcement	
Paternal Scale	-.21
Maternal Scale	.39
Parental Modeling	
Father's Education	.59
Mother's Education	.36
Mother's Employment-Hours	-.83
Mother's Employment- Period	.81
Mother's Employment- Type	.32
Father's Employment-Type	-.92
Educational Goals	.46
Interest in Math	-.40
Career Goals	.09

Data indicate that the three variables that correlated most highly with the discriminant function were, in order of importance, paternal occupation, maternal hours and period of employment. There was a moderate correlation of the discriminant function and paternal education, subjects' educational goals, and interest in mathematics. Paternal reinforcement, as well as the other maternal variables, i.e., reinforcement, education, and type of employment, made lesser contributions to group separation, whereas the contribution of subjects' career interests was small.

DISCUSSION

Results indicated that students were differentiated, primarily, on the basis of several parental variables. Fathers of the accelerated math group were engaged in math-related occupations to a considerably greater extent than were fathers of the regular math group. An analysis of specific occupations indicated that the professional occupations represented most frequently among fathers of the accelerated group were those of engineer, business executive, and systems analyst. On the other hand, the fathers of the regular math group who were employed in professional occupations tended to pursue careers as lawyers, publishers/writers, and real estate agents. The two groups were differentiated, primarily, along this dimension. This finding appeared to be most salient despite the fact that the father's educational level made only a moderate contribution to group separation. For both groups were relatively heterogeneous in terms of the number of years of postsecondary schooling reported for the father.

The effect of paternal modeling may be assessed more fully in view of the

impact of various maternal modeling predictors. Several maternal employment variables were second and third in importance in their contribution to group differences. In this regard, mothers of the accelerated math group were less likely to be employed or, if they were employed, were likely to have resumed employment while the daughter was in high school, rather than at an earlier period in the daughter's life. Further, the type of employment, as well as the mother's educational level, did not have a substantial impact on group separation. In this regard, mothers of both groups were not likely to have been employed in professional-level positions, or to have pursued postsecondary degrees.

In terms of parental reinforcement for academic/mathematics achievement, neither the maternal nor the paternal scales was important in distinguishing between the two groups. It is possible that both groups of females who attended a high school for gifted students received substantial parental reinforcement for achievement.

Of the three predictors which assessed the students' educational and career interests, the former variables had a moderate impact on group separation. In this regard, the accelerated math group expressed more definitive interests in obtaining graduate degrees and in electing math courses in high school and college than did the regular group. However, the smallest contribution to group differentiation was made by the variable which assessed students' career goals. Overall, definitive interests were not expressed by students in either group. The inclusion of ninth graders in a relatively small sample may have accounted for the negligible impact of this variable. It is possible that specific career

goals have not yet been formulated by ninth grade students.

Overall, an analysis of the relative impact of the eleven predictors indicated that parental reinforcement for academic/mathematics achievement made only a moderate contribution to group separation. On the other hand, several parental modeling variables had the greatest impact on group separation. The pattern which emerged suggested that females who elected to enroll in an accelerated math program tended to model their academic interests in consonance with the father's participation in math-related occupations. In view of the fact that the groups were somewhat heterogeneous in terms of the father's educational level, this finding may be particularly salient. Further, the mother's role, relative to the daughter's selection of an accelerated math program, did not emerge as particularly strong. Mothers of the accelerated group were not as likely as mothers of the regular group to be employed, particularly throughout the daughter's early years. Consequently, the importance of the father as a model may have been particularly crucial. Although specific career interests were not yet well defined, the interest in mathematics and postgraduate degrees expressed by the accelerated group may provide further support for the importance of paternal modeling.

The contribution of paternal modeling to enrollment in an accelerated high school mathematics program corroborated the results of an earlier study along this dimension. In this regard, career modeling patterns were evident for female students enrolled in non-traditional, rather than traditional graduate programs.

In view of these findings, it would be meaningful to extend the role of

important figures within the high school setting, e.g., teachers, guidance counselors, principals. If these significant others were to provide support and encouragement for mathematics participation and, particularly, if mathematics teachers were to provide modeling experiences, it is likely that a greater number of females would elect to pursue academic and career interests in mathematics.

REFERENCES

Aiken, L.R., Jr. Update on attitudes and other affective variables in learning mathematics. Review of Educational Research, 1976, 46 (2), 293-311.

Kaczala,C ., Futterman, R., Meece, J., & Parsons, J.E. Developmental shifts in expectancies and attributions for performance in mathematics. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, April, 1979.

Lyons, L. The relationship of parental reinforcement, parental modeling, need achievement, and need affiliation to the type of graduate program enrollment of females. Paper presented at the Annual Meeting of the American Educational Research Association, New York, April, 1977 (Resources in Education, Eric Clearinghouse on Higher Education, Document No. FDI38193, Washington, D.C., September, 1977).

Sherman, J. & Fennema, E. The study of mathematics by high school girls and boys: related variables. American Educational Research Journal, 1977, 14 (2), 159-168.

Steel, L., & Wise, L.L. Origin of sex differences in high school mathematics achievement and participation. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, April, 1979.